Statement of Basis

Air Quality
Construction Permit Revision

Deadwood Biofuels, LLC
Rapid City, South Dakota

South Dakota Department of Environment and Natural Resources

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1.0 BACKGROUND

Deadwood Biofuels was issued a permit to construct a wood pellet manufacturing facility near Rapid City, South Dakota, on August 20, 2010. The facility receives raw wood as either whole logs or chips, processes the wood into pellets, and bags and palletizes the pellets for shipment by rail or truck. The primary Standard Industrial Classification (SIC) code is 2499 – Wood Products, Not Elsewhere Classified.

Table 1-1 lists the units and processes that are covered under Deadwood Biofuels' existing construction permit (#28.4402-02-01C).

Table 1-1 – Description of Permitted Units, Operations, and Processes

Unit	Description	Maximum Operating Rate	Control Device
#1	Wood pellet milling, cooling and screening.	17.7 tons of feedstock per hour	Stairmand cyclone separator

On November 5, 2011, Deadwood Biofuels submitted an application to add a natural gas-fired dryer, hammermill, and three cyclones to the facility. The application was considered complete on November 17, 2011. The following units and processes will be reviewed for coverage under the permit:

Unit #2 Wood chip drying process - Dryer #1 – 1961 Heil three pass rotary drum dryer, model 105-32, with a maximum heat input capacity of 27 million Btus per hour. The dryer is fired with natural gas. Dried wood chips are recovered using two cyclones operated in parallel.

Unit #3 Secondary hammermill – 1998 Sprout hammermill, model 43365. Wood chips are recovered using a cyclone.

2.0 EMISSION FACTORS

The department uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, the department relies on manufacturing data, material balance, EPA's Air Pollutant Emission Factors AP-42 document, or other methods to determine potential air emissions. Potential emissions for each applicable pollutant are calculated by assuming the unit operates every day of the year at the maximum design capacity.

The potential natural gas usage for Unit #2 was calculated using Equation 2-1 and the maximum designed heat input. The maximum designed heat input is 27 million Btus per hour. The annual natural gas usage was determined to be 232 million cubic feet per year.

Equation 2-1 – Annual natural gas usage

$$Maximum\ Heat\ Input \frac{MMBtus}{hour} \times \frac{8{,}760 hours}{year} \times \frac{10^6\ Btus}{1 MMBtu} \times \frac{cf}{1{,}020 Btus} \times \frac{MMcf}{10^6\ cf}$$

The emission factors for the combustion of natural gas for units with a heat input capacity less than 100 million Btus per hour are given below. The emission factors for the combustion of natural gas are derived from AP-42, Table 1.4.-1 through Table 1.4-4 (7/98). The following emission factors are for units with heat input capacities less than 100 million Btus per hour:

- Total Suspended Particulate (TSP) = 7.6 pounds/MMcf;
- Particulate ≤ 10 microns in diameter (PM10) [1] = 7.6 pounds/MMcf;
- Particulate ≤ 2.5 microns in diameter (PM2.5) [1] = 7.6 pounds/MMcf;
- Nitrogen Oxides (NO_X) = 100 pounds/MMcf;
- Sulfur Dioxide (SO_2) = 0.6 pounds/MMcf;
- Volatile Organic Compounds (VOC) = 5.5 pounds/MMcf;
- Carbon Monoxide (CO) = 84 pounds/MMcf;
- Carbon dioxide equivalent (CO_2e) [2] = 120,730 pounds/MMcf
- Total Hazardous Air Pollutants (HAPs) = 1.889 pounds/MMcf.

[1] – All of the particulate matter emitted from the combustion of natural gas is assumed to be less than 0.1 microns in diameter. Therefore, the emission factors for PM10 and PM 2.5 are equivalent to TSP.
[2] – The carbon dioxide equivalent is the emission factor for carbon dioxide plus the emission factor for methane multiplied by 21 for its warming potential plus the emission factor for nitrous oxide multiplied by 310 for its warming potential: 120,000 + (2.3 x 21) + (2.2 x 310) = 120,730

3.0 POTENTIAL EMISSIONS

The potential emissions from the combustion of natural gas in the dryer (Unit #2) are summarized in Table 3-1.

Table 3-1 – Potential Emissions from Combustion of Natural Gas

Air Pollutant	Potential Consumption (million cubic feet/year)	Emission Factor (pounds/million cubic feet)	Potential Emissions (tons/year)
TSP/PM10/PM2.5	232	7.6	0.88
SO_2	232	0.6	0.07
NOx	232	100	11.60
VOCs	232	5.5	0.64
Total HAPs	232	1.89	0.22
CO	232	84	9.74
CO2e	232	120,730	14,005
Potential Emissions = (Potential Consumption x Emission Factor) / 2,000 pounds/ton			

Pope and Talbot, a lumber and wood pellet mill located in Spearfish, South Dakota, conducted a stack test on a pellet cooler and cyclone on April 18, 2007. The average operating rate during the stack test was estimated at 6.4 tons per hour. The average controlled total suspended controlled particulate

emission rate was 0.19 pounds per ton pellets produced. If a control efficiency of 80 percent is assumed for Pope and Talbot's cyclone, the resulting uncontrolled emission rate is 0.95 pounds per ton pellets.

The feed rate to the dryer is given in the application as 16.2 tons per hour. Based on the above assumptions, the potential controlled emissions are calculated as follows:

$$\text{PM} = \frac{16.2 tons}{hour} \times \frac{8{,}760 hours}{year} \times \frac{0.19 pounds}{ton} \times \frac{ton}{2{,}000 pounds} = 13.5 \text{ tons/year}$$

According to the information submitted in the application the feed rate to the second hammermill (Unit #3) is 9.9 tons per hour. The potential controlled emissions are calculated as follows:

$$\text{PM} = \frac{9.9 tons}{hour} \times \frac{8{,}760 hours}{year} \times \frac{0.19 pounds}{ton} \times \frac{ton}{2{,}000 pounds} = 8.2 \text{ tons/year}$$

The potential particulate emissions from Unit #1 from the previous review were 73.6 tons per year. Deadwood Biofuels potential emissions of any criteria pollutant (particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, and volatile organic carbon) are less than the major source threshold of 100 tons per year. Therefore, Deadwood Biofuels is considered a minor source.

4.0 PERMIT REQUIREMENTS

4.1 New Source Review

ARSD 74:36:10:01 states that New Source Review (NSR) regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. The proposed facility will be located near Rapid City, South Dakota, which is in attainment or unclassifiable for all the pollutants regulated under the Clean Air Act. Therefore, Deadwood Biofuels is not subject to NSR review.

4.2 Prevention of Significant Deterioration

A prevention of significant deterioration (PSD) review applies to new major stationary sources and major modifications to existing major stationary sources in areas designated as attainment under Section 107 of the Clean Air Act for any regulated air pollutant. The following is a list of regulated air pollutants under the PSD program:

1. Total suspended particulate (PM);
2. Particulate with a diameter less than or equal to 10 microns (PM10);
3. Particulate with a diameter less than or equal to 2.5 microns (PM2.5);
4. Sulfur dioxide (SO_2);
5. Nitrogen oxides (NOx);
6. Carbon monoxide (CO);
7. Ozone – measured as volatile organic compounds (VOCs);

8. Lead;
9. Fluorides;
10. Sulfuric acid mist;
11. Hydrogen sulfide;
12. Reduced sulfur compounds;
13. Total reduced sulfur; and
14. Greenhouse gases (carbon dioxide, methane, nitrous oxide, etc.).

If the source is considered one of the 28 named PSD source categories listed in Section 169 of the federal Clean Air Act, the major source threshold is 100 tons per year of any regulated air pollutant, except for greenhouse gases. The major source threshold for all other sources is 250 tons per year of any regulated air pollutant, except for greenhouse gases. Deadwood Biofuels is not considered one of the 28 listed source categories for PSD regulations and the major source threshold is 250 tons per year, except for greenhouse gases. Based on administrative necessity, EPA increased the major source thresholds for greenhouse gas emissions through the "Tailoring Rule."

On May 13, 2010, EPA issued the final version of the "Tailoring Rule" for greenhouse gas emissions. The major source threshold for greenhouse gases is listed below:

1. New PSD source because of a criteria air pollutant, the major source threshold for greenhouse gases is 75,000 tons per year of carbon dioxide equivalent or more;
2. New PSD source if greenhouse gas emissions are 100,000 tons per year of carbon dioxide equivalent or more;
3. For an existing PSD source because of a criteria air pollutant, a major modification for greenhouse gases is an increase of 75,000 tons per year of carbon dioxide equivalent or more;
4. For an existing non-PSD source that has the potential to emit 100,000 tons per year of carbon dioxide equivalent emissions or more, a major modification for greenhouse gases is an increase of 75,000 tons per year of carbon dioxide equivalent or more; and
5. In addition to subsection (2) and (4), a specific greenhouse gas, without calculating the carbon dioxide equivalent, also needs to emit greater than 100 or 250 tons per year, whichever is applicable, to be regulated.

Therefore, Deadwood Biofuels is a minor source under the PSD program and is not subject to PSD requirements.

4.3 New Source Performance Standards

The department reviewed the New Source Performance Standards in 40 CFR Part 60 and determined that there are no New Source Performance Standards that are applicable to Deadwood Biofuels' operations.

4.4 National Emission Standards for Hazardous Air Pollutants (Part 61)

The department reviewed the National Emission Standards for Hazardous Air Pollutants (NESHAP) in 40 CFR Part 61 and determined that there are no NESHAP standards applicable to Deadwood Biofuels' operations.

4.5 National Emission Standards for Hazardous Air Pollutants (Part 63)

The department reviewed the maximum achievable control technology (MACT) standards in 40 CFR Part 63 and determined that there are no MACT standards applicable to Deadwood Biofuels' operations.

4.6 State Emission Limits

4.6-1 Particulate Emission Limits for Fuel Burning Units

In accordance with ARSD 74:36:06:02(1)(b), a fuel burning unit with a heat input equal to or greater than 10 million Btus per hour heat input may not exceed the particulate emissions rate determined by 4-1:

Equation 4-1 – Particulate Emission Limit for Unit #2 (Natural gas combustion)

$E = 0.811 \times H^{-0.131}$ where:

E = emission rate in pounds per million Btu heat input, and
H = heat input in million Btus per hour.

$E = 0.811 \times 27^{-0.131}$
E = 0.5 pounds per MMBtus heat input

The particulate emission rate for Unit #2 and #3 is derived from ARSD 74:36:06:03(1)(a) – Emissions rate for process industry units with process weight rates up to 60,000 pounds per hour.

The particulate emission rate may not exceed the rate calculated by Equation 4-2 for Unit #2 and Equation 4-3 for Unit #3.

Equation 4-2 – Particulate Emission Limit for Unit #2 (Wood drying)

$E = 4.10 \times P^{0.67}$ where, E = emission rate in pounds per hour, and
$E = 4.10 \times 16.2^{0.67}$ P = process weight rate in tons per hour
E = 26.5 pounds/hour

The potential emission rate is calculated by multiplying the maximum operating rate (16.2 tons per hour) by the emission rate (0.95 pounds per ton). This results in a potential particulate emission rate of 15.4 pounds per hour, which is less than the state's particulate emission limit of 26.5 pounds per hour.

Equation 4-3 – Particulate Emission Limit for Unit #3

$E = 4.10 \times P^{0.67}$ where, E = emission rate in pounds per hour, and
$E = 4.10 \times 9.9^{0.67}$ P = process weight rate in tons per hour
E = 19.0 pounds/hour

The potential emission rate is calculated by multiplying the maximum operating rate (9.9 tons per hour) by the emission rate (0.95 pounds per ton). This results in a potential particulate emission rate of 9.4 pounds per hour, which is less than the state's particulate emission limit of 19.0 pounds per hour.

4.6-2 Sulfur Dioxide Emission Limits

In accordance with ARSD 74:36:06:02(2), a fuel burning unit may not emit sulfur dioxide emissions to the ambient air in an amount greater than three pounds of sulfur dioxide per million Btus of heat input based on a three-hour rolling average, which is the arithmetic average of three contiguous one-hour periods.

4.6-3 Visible Emissions

The state of South Dakota has opacity requirements. In accordance with ARSD 74:36:12, a facility may not discharge into the ambient air from a single unit of emissions an air pollutant of a density equal to or greater than that designated as 20 percent opacity.

4.7 Air Quality Construction Permit

Any source operating in South Dakota that meets the requirements of the ARSD 74:36:20:01 is required to obtain an air quality construction permit. Deadwood Biofuels potential emissions are below the major source threshold. Therefore, the facility is a minor source. Deadwood Biofuels will be required to submit an application for a minor source air quality operating permit within 12 months of startup of the wood pellet manufacturing facility.

4.8 Summary of Applicable Requirements

A source operating in South Dakota that meets the definition of a minor source is required to obtain a minor air quality operating permit under ARSD 74:36:04. Deadwood Biofuels will be required to apply for a minor source operating permit within 12 months of startup of the wood pellet manufacturing facility and is required to comply with the requirements stipulated in the following regulations:

- ARSD 74:36:06 – Regulated Air Pollutants;
- ARSD 74:36:11 – Performance Testing;
- ARSD 74:36:12 – Control of Visible Emissions; and
- ARSD 74:36:20 – Construction Permits for New Sources or Modifications.

A stack performance test will be required on the cyclones to verify compliance with the particulate emission limit.

5.0 RECOMMENDATION

Based on the information submitted in the air quality permit application, the department recommends conditional approval of an air quality construction permit revision for Deadwood Biofuels in Rapid City, South Dakota. Questions regarding this permit review should be directed to Marlys Heidt, Engineer III.

Appendix A
Modification of Air Quality Construction Permit

The following changes to the existing permit represent changes that meet the definition of a permit modification. Additions to the existing permit are represented in blue, bold, and underlined and deletions are represented in red with overstrikes. In the case where permit conditions are deleted or added between permit conditions, the permit conditions will be renumbered appropriately when the permit is issued.

1.0 STANDARD CONDITIONS

1.1 **Construction and operation of source.** In accordance with Administrative Rules of South Dakota (ARSD) 74:36:20:15(9), the owner or operator shall construct and operate the units, controls, and processes as described in Table 1-1 in accordance with the statements, representations, and supporting data contained in the complete permit application submitted and dated February 26, 2010, April 16, 2010, ~~and~~ May 20, 2010, **and November 5, 2011,** unless modified by the conditions of this permit. Except as otherwise provided herein, the control device in Table 1-1 shall be operated in manner that achieves compliance with the conditions of this permit at all times. The application consists of the application forms, supporting data, and supplementary correspondence. If the owner or operator becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in an application, such information shall be promptly submitted.

Table 1-1 – Description of Permitted Units, Operations, and Processes

Unit	Description	Maximum Operating Rate	Control Device
#1	Wood pellet milling, cooling and screening	17.7 tons of feedstock per hour	Stairmand cyclone separator
#2	**Wood chip drying process – Dryer #1 – 1961 Heil three pass rotary drum dryer, model 105-32, fired with natural gas. Dried wood chips are recovered using two cyclones operated in parallel.**	**27 million Btus per hour heat input** **16.2 tons of wood chips per hour**	**Not applicable**
#3	**Secondary Hammermill – 1998 Sprout hammermill, model 43365. Wood chips are recovered using a cyclone.**	**9.9 tons per hour**	**Not applicable**

5.0 CONTROL OF REGULATED AIR POLLUTANTS

5.3 Total suspended particulate matter limits. In accordance with ARSD 74:36:06:03(1), the owner or operator shall not allow the emission of total suspended particulate matter in excess of the emission limit specified in Table 5-1 for the appropriate permitted unit, operations, and process.

Table 5-1 – Total Suspended Particulate Emission Limit

Unit	Description	Emission Limit
#1	Stairmand Cyclone separator	28.1 pounds per hour
#2	Cyclone #1 and Cyclone #2	26.5 pounds per hour
#3	Cyclone #3	19.0 pounds per hour

5.4 Sulfur dioxide limits. In accordance with ARSD 74:36:06:02(2), the owner or operator shall not allow the emission of sulfur dioxide in excess of the emission limit specified in Table 5-2 for the appropriate permitted unit, operations, and process.

Table 5-2 – Sulfur Dioxide Emission Limit

Unit	Description	Emission Limit
#2	Dryer #1	3.0 pounds per million Btu heat input

Compliance with the sulfur dioxide emission limit is based on a three-hour rolling average, which is the arithmetic average of three contiguous one-hour periods.

6.0 PERFORMANCE TESTS

6.7 Performance test on cyclone separators. In accordance with ARSD 74:36:11:02, the owner or operator shall conduct a stack performance test on the Stairmand cyclone separator**, the common emission point for Cyclones #1 and #2, and Cyclone #3** within 60 days of initial startup of the wood pellet manufacturing facility. For the purpose of this permit condition, initial startup means the first date wood pellets are produced. The performance test shall be conducted to determine the total suspended particulate emission rate, in pounds per hour and pounds per ton of feed rate, and demonstrate compliance with the emission limit in permit condition 5.3.